



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

OVERSIZE

GB
494
G3

HARVARD UNIVERSITY



LIBRARY OF THE
DEPARTMENT OF
GEOLOGY AND GEOGRAPHY

Transferred to
CABOT SCIENCE LIBRARY
June 2005

110
14
-3

OCT 3 01979

DEPARTMENT OF THE INTERIOR—U. S. GEOLOGICAL SURVEY

J. W. POWELL, DIRECTOR

THE

AVERAGE ELEVATION OF THE UNITED STATES

BY

HENRY GANNETT

EXTRACT FROM THE THIRTEENTH ANNUAL REPORT OF THE DIRECTOR, 1891-'92



WASHINGTON
GOVERNMENT PRINTING OFFICE
1894

DEPARTMENT OF THE INTERIOR—U. S. GEOLOGICAL SURVEY.

THE AVERAGE ELEVATION OF THE UNITED STATES,

BY

HENRY GANNETT.

283

THE AVERAGE ELEVATION OF THE UNITED STATES.

BY HENRY GANNETT.

For several years the United States Geological Survey has been engaged in the compilation of measurements of altitudes of points in the United States, primarily for use as datum points in connection with the preparation of its detailed maps. The results of this compilation have from time to time been published in the form of a dictionary of altitudes, the first edition of which constituted Bulletin No. 5 and a second edition Bulletin No. 76. As a by-product, a map of the United States upon a scale of $\frac{1}{3800000}$, or about 40 miles to an inch, has recently been published showing approximate contour lines at the following elevations above sea level: 100, 500, 1,000, 1,500, 2,000, 3,000, 4,000, 5,000, 6,000, 7,000, 8,000, 9,000, 10,000, 11,000, and 12,000 feet. From this map has been produced by reduction the map presented in this volume as Plate CVII.

These contour lines were constructed from the following material:

(1) By reduction and generalization of contour maps from surveys upon much larger scales. In the portion of the map contoured by this means the contours can be regarded as correct. The maps thus used are enumerated as follows:

The maps of the United States Geological Survey of the Hayden, Powell, and King (Fortieth Parallel) surveys in the West, the Northern Transcontinental survey, the New Jersey Geological survey, and the Minnesota Geological and Natural History survey.

These maps sufficed to contour the following areas: All of Massachusetts, Rhode Island, New Jersey, and District of Columbia, western Connecticut and Maryland, most of Virginia and West Virginia, western North Carolina, eastern Tennessee, eastern Kentucky, northern Georgia and northern Alabama, the southern half of Minnesota, most of Missouri, part of the Ozark Hills of Arkansas, the eastern half of Kansas, central Texas, the mountain region of Colorado, all of Utah, the northern half of Arizona, northwestern New Mexico, parts of Wyoming, Idaho, Montana, Nevada, and Washington with northern California and southern Oregon, besides trifling areas in other states. These areas comprise much the greater part of the mountainous and

most difficult regions. Altogether about one-fifth of the area of the country was contoured by this means.

(2) By platting the compiled measurements of altitude upon maps and sketching contours with reference to these measurements, using the best available hachure maps as guides in interpreting the measured heights and in locating contours between them. This method, which was used in compiling much the greater portion of the map, has naturally produced results differing greatly in different regions with the density of distribution of the measurements of heights and with the character of surface, whether mountainous or plain, and with the knowledge possessed of the surface. About 25,000 measurements of height have been so used, an average, if they were uniformly distributed, of about 12 to a square inch of the map. This number of measurements, combined with a knowledge of the relief of the country, would be adequate for the location of contours with a high degree of accuracy almost anywhere in the country. They are not, however, distributed by any means uniformly. A great majority of them are from railroad levels, and consequently the east is much better represented than the west. The level prairies of Illinois are intersected by a perfect network of railroad lines, while in the Cordilleran region, the railroads are separated by broad areas of mountain and valley. In this region, however, the scarcity of railroad measurements of height is supplemented by barometric measurements made by the numerous explorations under the War Department, notably that known as the Wheeler survey, whose excellent maps and measurements have been used wherever available. There remain, however, certain areas concerning which little information of any kind is to be had.

The contours of the map may be classified with respect to their probable accuracy into four groups.

A. Correct. Those areas reduced from contour maps.

B. Very nearly correct. The Atlantic Slope, east of the Blue Ridge; the entire Mississippi Valley, to the base of the Rocky Mountains and of the Staked Plains; the region of the Great Lakes; the valleys of California and Oregon.

C. Approximately correct. The remainder of New England, except northern Maine. New York except the Adirondack region. Pennsylvania and the Cordilleran region, except the areas enumerated below.

D. Hypothetical. Northern Maine, Adirondack region of New York, central Idaho, the Cascade range and the Coast range of Washington, Oregon and northern California.

From the map, the strength and weakness of which have been characterized above, the areas between the various contour lines have been measured with considerable care up to 10,000 feet. Above that altitude the areas are so small in all the States except Colorado, that they have been grouped under the heading "Above 10,000 feet." The results are given below.

286 THE AVERAGE ELEVATION OF THE UNITED STATES.

TABLE I.—Areas between

[Altitude in feet;

States and Territories.	0-100.	100-500.	500-1,000.	1,000-1,500.	1,500-2,000.	2,000-3,000.
Alabama.....	4,400	30,000	14,240	3,000	610	.....
Arizona.....	.....	2,000	7,000	6,900	8,200	15,600
Arkansas.....	.....	35,200	8,350	6,000	3,600	700
California.....	11,000	24,000	16,700	11,400	13,800	17,400
Colorado.....	.....	.....	.....	.....	.....	.....
Connecticut.....	1,100	2,000	1,230	660	.....	.....
Delaware.....	1,900	150	.....	.....	.....	.....
District of Columbia.....	20	50	.....	.....	.....	.....
Florida.....	44,800	13,880	.....	.....	.....	.....
Georgia.....	5,900	29,600	16,300	5,400	2,175	100
Idaho.....	.....	.....	.....	100	400	5,800
Illinois.....	.....	11,900	44,750	.....	.....	.....
Indiana.....	.....	4,700	28,800	2,850	.....	.....
Iowa.....	.....	.....	19,600	35,645	780	.....
Kansas.....	.....	.....	8,300	25,900	13,900	19,600
Kentucky.....	.....	8,000	26,900	4,100	1,300	100
Louisiana.....	34,000	14,720	.....	.....	.....	.....
Maine.....	6,000	10,800	8,400	6,740	1,100	.....
Maryland.....	7,400	2,000	1,700	300	410	400
Massachusetts.....	2,000	3,265	1,800	1,150	100	.....
Michigan.....	.....	.....	45,700	11,515	1,700	.....
Minnesota.....	.....	.....	16,400	59,365	7,600	.....
Mississippi.....	4,000	41,510	1,300	.....	.....	.....
Missouri.....	.....	8,800	39,140	20,100	1,375	.....
Montana.....	.....	.....	.....	1,000	35,600	34,600
Nebraska.....	.....	.....	900	11,700	14,300	24,510
Nevada.....	.....	.....	.....	.....	.....	5,400
New Hampshire.....	400	1,955	2,800	2,800	800	400
New Jersey.....	4,100	2,100	1,400	215	.....	.....
New Mexico.....	.....	.....	.....	.....	.....	1,200
New York.....	2,400	10,900	16,100	12,500	5,170	1,700
North Carolina.....	18,700	13,100	10,000	3,200	1,000	8,100
North Dakota.....	.....	.....	5,800	12,200	25,300	26,895
Ohio.....	.....	760	29,800	10,500	.....	.....
Indian Territory.....	.....	1,800	33,130	16,430	9,000	6,500
Oklahoma.....	.....	.....	.....	.....	.....	.....
Oregon.....	1,700	8,800	9,800	6,200	6,300	6,700
Pennsylvania.....	600	5,500	12,700	15,900	8,215	2,300
Rhode Island.....	470	650	130	.....	.....	.....
South Carolina.....	10,600	10,900	8,100	900	70	.....
South Dakota.....	.....	.....	270	18,100	24,200	23,000
Tennessee.....	.....	12,400	15,800	7,600	4,900	1,150
Texas.....	23,600	58,400	39,380	19,800	22,200	44,100
Utah.....	.....	.....	.....	.....	.....	1,000
Vermont.....	.....	1,965	3,000	2,600	1,100	300
Virginia.....	9,700	10,500	5,950	4,700	4,200	6,800
Washington.....	5,000	6,000	9,000	18,000	12,111	8,000
West Virginia.....	.....	.....	7,900	6,000	4,200	5,280
Wisconsin.....	.....	.....	26,600	24,640	4,800	.....
Wyoming.....	.....	.....	.....	.....	.....	.....
United States.....	199,790	388,305	545,770	396,080	240,516	262,635

different degrees of altitude.

area in square miles.]

3,000-4,000.	4,000-5,000.	5,000-6,000.	6,000-7,000.	7,000-8,000.	8,000-9,000.	9,000-10,000.	Above 10,000.
12,500	13,600	23,900	16,520	6,100	500	200	
14,000	16,500	13,500	8,300	4,800	3,400	1,800	1,760
4,900	22,700	17,100	12,725	13,500	11,500	8,600	12,900
14,500	26,150	21,900	10,600	4,540	800	10	
14,200	180						
30,700	19,900	13,480	6,800	2,800	1,000	200	
16,600	9,300	200					
11,100	23,700	29,800	30,100	7,800	2,800		
150							
6,000	34,200	31,280	25,400	18,500	4,000	1,400	600
200	200						
2,650	400	100					
600							
1,800	1,800						
9,400	24,100	16,900	5,200	730	200		
8,900	1,800	700	500	180			
200							
20,100	29,800	2,000	400				
500	24,900	21,100	15,970	10,800	6,200	2,800	1,700
600							
6,000	3,300	1,200	500	60			
1,200	200						
	11,100	22,000	26,500	23,290	8,600	4,100	2,300
182,800	263,830	215,160	159,515	93,100	39,000	19,110	19,200

From this table it appears that no considerable part of Delaware, District of Columbia, Louisiana or Rhode Island exceeds 500 feet above sea level; that in Illinois and Mississippi there is no area above 1,000 feet; that in Connecticut, Indiana, New Jersey and Ohio, no part of the surface is above 1,500 feet, that the 2,000-foot contour is not found in Alabama, Iowa, Maine, Massachusetts, Michigan, Minnesota, Missouri, South Carolina or Wisconsin, the 3,000-foot in Arkansas, Georgia, Kentucky, Maryland or Pennsylvania, the 4,000-foot in North Dakota, Tennessee, Vermont or Virginia, the 5,000-foot contour in Kansas, New Hampshire, New York, Indian Territory or West Virginia. The 6,000-foot contour is the highest represented east of the Cordilleran region and includes no areas of magnitude in Nebraska or North Carolina. The 7,000-foot contour overtops the highest areas in Texas; that of 8,000 feet is above the summits of the Black Hills, the highest land in South Dakota, and above all considerable areas in Washington; while that of 9,000 feet overlies all considerable areas, so far as known, in Idaho, Nevada, and Oregon. The contour of 10,000 feet is higher than any extended area in Arizona and Montana, while in the States of California, Colorado, New Mexico, Utah and Wyoming, are extensive areas above this contour line.

On the other hand, the entire state of Wyoming lies above the contour of 4,000 feet, Colorado lies above that of 3,000 feet and Nevada, New Mexico and Utah above the 2,000-foot line. Idaho and Montana are entirely above the contour of 1,000 feet, while above the 500-foot line are the entire areas of Iowa, Kansas, Michigan, Minnesota, Nebraska, North and South Dakota, West Virginia and Wisconsin. The lower limits of Arizona, Arkansas, Illinois, Indiana, Kentucky, Missouri, Ohio, Indian Territory, Tennessee and Vermont, are found to be more than 100 feet above the sea. The remaining states extend nearly or quite to sea level.

Of all the states, California has the widest range in altitude, extending from sea level to nearly 15,000 feet with a considerable area above 10,000 feet. Of all the states Colorado has much the largest area above 10,000 feet, an area considerably in excess of that of all other states combined, and whereas in the other states this elevated area consists merely of mountain ranges, in Colorado there are broad stretches of plateau and extensive mountain valleys, above this altitude.

In the following table is presented an approximation to the mean or average elevation of each state and territory of the United States. These have been deduced in part from the figures of Table I, in part from other data.

The average elevation of the United States and of such of the states as present a considerable range of elevation, has been determined from this Table I, in the following manner: The area between two consecutive contour lines has been assumed to have an average elevation halfway between these contours. Thus, in Colorado the area between

5,000 and 6,000 feet has been assumed to have a mean elevation of 5,500 feet. This assumption is not absolutely correct, but, as shown by Mr. Murray (Scottish Geographic Magazine), it involves no serious error. The areas between consecutive contours were then multiplied by these assumed average elevations, the several products added together, and their sum divided by the total area of the state or country.

In cases where the range of elevation is but slight, as in Delaware, Florida, and the District of Columbia, the mean elevation was obtained by taking the mean of all measured altitudes within its limits. Inasmuch as these states are in the eastern half of the country, and the measurements of height within their limits are numerous and well distributed, the average elevations of these states are well determined.

TABLE II.—*Mean elevation.*

State and Territory.	Feet.	State and Territory.	Feet.
Alabama.....	500	Nevada.....	5,500
Arizona.....	4,100	New Hampshire.....	1,000
Arkansas.....	650	New Jersey.....	250
California.....	2,900	New Mexico.....	5,700
Colorado.....	6,800	New York.....	900
Connecticut.....	500	North Carolina.....	700
Delaware.....	60	North Dakota.....	1,900
District of Columbia.....	150	Ohio.....	850
Florida.....	100	Indian Territory.....	1,300
Georgia.....	600	Oklahoma.....	1,300
Idaho.....	5,000	Oregon.....	3,300
Illinois.....	600	Pennsylvania.....	1,100
Indiana.....	700	Rhode Island.....	200
Iowa.....	1,100	South Carolina.....	350
Kansas.....	2,000	South Dakota.....	2,200
Kentucky.....	750	Tennessee.....	900
Louisiana.....	100	Texas.....	1,700
Maine.....	600	Utah.....	6,100
Maryland.....	350	Vermont.....	1,000
Massachusetts.....	500	Virginia.....	950
Michigan.....	900	Washington.....	1,700
Minnesota.....	1,200	West Virginia.....	1,500
Mississippi.....	300	Wisconsin.....	1,050
Missouri.....	800	Wyoming.....	6,700
Montana.....	3,400	United States.....	2,500
Nebraska.....	2,600		

From this table it appears that Colorado has the greatest average elevation of all the states and territories. Wyoming follows closely, then Utah, with New Mexico and Nevada, all of these having an average elevation greater than 5,000 feet.



3 2044 032 891 814

Gannett, Henry

AUTHOR

TITLE

United States.

DATE DUE

BORROWER'S NAME

NOV 27 1979

HSPN

NOV 27 1970 HSPH
D. OAKLEY ENV. HEALTH SCI.

NOV 27 1970

[illegible]

GAYLORD

PRINTED IN U.S.A.

